POLICY RESEARCH WORKING PAPER 3125

Economic Analysis of Health Care Utilization and Perceived Illness

Ethnicity and Other Factors

Vicente B. Paqueo
Christian Y. Gonzalez

The World Bank
Latin America and the Caribbean Region
Social Protection Sector Unit
August 2003

POLICY RESEARCH WORKING PAPER 3125

Abstract

Paqueo and Gonzalez look at the determinants of health-seeking behavior of the Mexican population and within this context focus on the effect of ethnicity. They address the following questions:

- To what extent are the indigenous people at a disadvantage health care-wise and in what particular health services are they disadvantaged?
- Is the health care gap due to indigenous cultures by itself as opposed to the impact of socioeconomic differences?
- What policy instruments can be used to reduce the gap?

The authors find that contrary to expectations, the indigenous people in Mexico tend to have a positive behavior toward modern preventive care compared with the nonindigenous population, holding socioeconomic factors constant. Apparently, there is no cultural barrier in regard to these services. But ethnicity remains negatively associated with the use of inpatient hospital care and medical and dental consultations. Insurance has a significant and positive effect on health care use. Therefore, it appears to be an effective instrument for addressing the health care disadvantages faced by the indigenous population in regard to inpatient care and the use of outpatient services of doctors, nurses, and dentists.

This paper—a product of the Social Protection Sector Unit, Latin America and the Caribbean Region—is part of a larger effort in the region to draw on lessons from Mexico on the provision of health services to indigenous people. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Roberto Guzman, room I7-168, telephone 202-473-2993, fax 202-676-0319, email address rguzman@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at vpaqueo@worldbank.org or cgonzalez@worldbank.org. August 2003. (24 pages)

Economic Analysis of Health Care Utilization and Perceived Illness: Ethnicity and Other Factors

Vicente B. Paqueo and Christian Y. Gonzalez

World Bank, 1818 H Street NW
Washington DC 20433, USA

vpaqueo@worldbank.org
cgonzalez@worldbank.org

Economic Analysis of Health Care Utilization and Perceived Illness: Ethnicity and Other Factors

By *Vicente B. Paqueo* and *Christian Y. González*[1]

Introduction

Mexico has the largest indigenous population in the Americas. Estimates of the size of the indigenous population vary, depending on its definition. But based on usage of languages other than Spanish (there are more than 60 of them), official estimates point to a population size of at least 8.4 million in 2000, which is roughly 8.6 percent of the total population. Of the 2,443 municipalities, 803 can be classified as "indigenous" in the sense that they constitute more than 30 percent of their population.[2] The indigenous people includes descendants from the diverse ethnic groups that made up the Aztec empire such as the Náhua, the Maya, the Zapotecs, the Mixtecs, the Totonacs and the Tarascos.

Over the years, many of Mexico's indigenous populations have managed to maintain their own language, culture and traditions. Land is central to life, culture, and history – and determines to a large extent the survival of indigenous peoples, as well as their standards of living, health and nutrition.

There has been a rising concern on the need to give greater special attention to Mexico's indigenous population. The principal reason is that they lag way behind other groups economically and socially. For example, eighty-eight percent of those indigenous municipalities have been classified as highly marginalized or very poor.[3] The degree of poverty is even worse for the 13,000 localities with more than 70 percent of its population speaking indigenous languages. Further, compared to the national average, the living conditions of the indigenous population are lower, as measured by per capita income, employment, health indicators, education, access to basic water, sanitation, housing, and food availability. It is remarkable that the seven states with the highest incidence of poverty – Chiapas, Oaxaca, Guerrero, Hidalgo, Veracruz, San Luis Potosi, and Puebla – coincide with the indigenous municipalities of highest marginality.[4]

This study examines the *Encuesta Nacional de Salud 2000* and analyzes the determinants of health service utilization and illness as assessed by the respondents. Its objective is to quantify the gap in health care utilization and understand better the nature of the gap and its causes. The analysis takes a broad view in approaching its objective. It looks at the determinants of health-seeking behavior of the general Mexican population and within this context it focuses on the effect of ethnicity. In the multivariate

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[1] Opinions in this paper are those of the authors and do not reflect official positions of the World Bank. We received helpful comments from María Luisa Escobar and Panagiota Panopoulou, who are nevertheless not responsible for any remaining errors. Also, we would like to thank Roberto Guzman for his assistance.

[2] Programa Nacional de Desarrollo de los Pueblos Indígenas, 2001-2006

[3] Programa Nacional de Desarrollo de los Pueblos Indígenas, 2001-2006

[4] World Bank (2001), Third Basic Health Care Project (PROCEDES), Project Appraisal Document

econometric method used in this paper to analyze the effect of ethnicity, relevant economic, demographic, and environmental factors were taken into account. The questions to be addressed in this regard are: To what extent are the indigenous people at a disadvantage health care-wise and in what particular health services are they disadvantaged? Is the health care gap due to indigenous culture *per se* as opposed to the impact of socioeconomic factors such as wealth, health insurance coverage, education and access cost?

The paper is structured as follows. First, it presents background information, laying out a stylized comparison of the indigenous versus non-indigenous population. Second, it describes the methodology and the data used for the analysis. Third, the econometric results are presented and analyzed. Finally, in the conclusion, the report summarizes its findings and their implications.

The indigenous population and the health challenge.

As elsewhere, the health status of Mexico's indigenous population has lagged behind that of other population groups. A World Bank appraisal report (2001) highlighted this health gap. On this, the National Development Program for the Indigenous Population (NDPIP), 2001-2006, indicate that the infant mortality rate among the indigenous people is 58 percent higher than the national average. And their life expectancy appears to be only about 69 years in contrast to the national average of 74 years.

Infectious diseases, malnutrition, vector-borne diseases and other illnesses associated with poverty and underdevelopment have been a major cause of the health gap. The NDPIP 2001-2006 reveals that chronic malnutrition among indigenous children less than 5 years old is 44 percent compared with the national average of only 17.7 percent. Moreover, the indigenous maternal mortality rate appears to be about triple that of non-indigenous mothers. Further, the World Bank appraisal report (2001) indicates that in the 1990s the national infant mortality due to infectious diseases stood at only 27.3 percent, while the rate for the indigenous population reached 83.6 percent.

Access to health services by the indigenous population remains a key issue, although data indicates that significant progress has been made in this regard. In 1991 there were only 537 primary health care centers and four secondary level health units in communities largely populated by indigenous groups. In 1997, these figures rose to 2,095 and 31 units, respectively. Nevertheless, these communities apparently continue to be at a disadvantage. For example, in the indigenous communities in Oaxaca the number of doctors per 1000 indigenous people is only 0.13 compared to 0.93 for the state as a whole. In regard to hospital beds, the figures for Oaxaca, Veracruz, and Puebla are only 0.07, 0.11 and 0.19 beds per 10,000 inhabitants in the indigenous areas, respectively – compared to the national average of 0.79. Further, the NDPIP has pointed out that 87 percent of the inhabitants of communities classified as indigenous are not covered by social security services.

Historically, there were little systematic and comprehensive efforts to develop programs that were specifically directed at the indigenous people as such. This fact does not mean that the health problems of the indigenous people were ignored. Rather, they were addressed as part of government efforts to improve the health of people in the rural and marginalized (disadvantaged) communities. Given that the indigenous people were largely located in these communities, they should in principle benefit from these programs. A list of these programs in relation to the evolution of Mexico's health policy is presented in "The Health Care System in Mexico."[5] Notable examples of these programs currently include IMSS-Solidaridad, PAC (Programa de Ampliación de Cobertura) and, more recently, PROGRESA (now called Oportunidades). The focus of those efforts has largely been on the promotion of primary health care such as maternal and child care, control of vector-borne diseases, health education, family planning, nutrition, immunization and other preventive care.

Many of these programs to a considerable extent took into account the indigenous people's particular circumstances, despite the government's lack of explicit targeting. These programs follow in principle a health care strategy that calls for mobilization of local resources and greater sensitivity to community constraints and preferences. Within this context, government supported initiatives (such as the promotion of traditional medicine and training of birth attendants) that could be expected to facilitate directly the health care of indigenous groups.

Nevertheless, because the indigenous communities *per se* were not considered as an explicit target population, it has been argued that not enough attention has been paid to their social and cultural characteristics. Moreover, not enough resources have been allocated to their health care. A rough estimate by the Subsecretaria de Egresos de Hacienda indicates that in 2002 the amount of Federal spending per capita going to the indigenous population was only 128 pesos per year, which is only about a third of the IMSS-Solidaridad average.

In conclusion, it can be argued that the health gap between the general and the indigenous population is due to the economic and social disadvantages suffered by the latter. But it can also be argued, as commonly believed, that the health gap might also be due to government failure to focus on the need to take more fully into account the social and cultural conditions of the indigenous population[6]. More generally, it can be hypothesized that demand for modern health services is relatively low among the indigenous people because of the failure of the health system to adapt its health services to their cultural heritage and circumstances. The implication is that there is a need to develop a health strategy that directly and explicitly focuses on the health problems of the indigenous people and tailors health interventions more adequately to their specific cultural and social conditions. This point of view is supported by the 2001 constitutional reform that now explicitly recognizes the obligation of the state to ensure that these groups have access to effective health care – one that is tailored to their particular conditions and takes advantage of their traditional medicine and cultural heritage.

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[5] Financing Health Care, Volume 22, National Economic Research Associates, 1998.
[6] World Bank (2001), Third Basic Health Care Project (PROCEDES), Project Appraisal Document

The conceptual framework.

A household production model guides the empirical analysis carried out in this study. In this model, which is illustrated graphically in Chart 1 (below), health and other commodities such as child education are produced, given existing knowledge and technology, by a combination of market goods and time inputs by household members. For example, given the environmental health threats surrounding a household (e.g. the presence of malaria and dengue in a community), the health status of a child can be thought of as the result of a combination of health care services, goods, and mother's time devoted to childcare. Taking into account its budgetary and other constraints, a household is assumed to choose that level of health for its members and that amount of consumption of other commodities that maximize its welfare. The demand for preventive, curative and other health services can then be expressed as a function of household wealth, the price of health services, the environmental health threats, and other exogenous factors such as education, age and culture that either affect the production function, the resource constraint, or the household's utility function. In principle, the same exogenous factors determine the health status of household members.

To estimate the effect of ethnicity and other exogenous variables, a logit model is used for its convenience in the interpretation of the regression estimates. From the household production model, these results are expected:

- Since health is a normal commodity, household wealth is expected to have a positive impact.
- Health insurance increases demand for health care, since it reduces the price of health service use.
- The time (distance) it takes to access a health service reduces the use of that service; it may, however, increase the use of other health services, depending on whether they are substitutes or complements.
- Greater public health threats due to the presence of malaria and dengue as well as lack of potable water are likely to raise demand for preventive and curative services.
- Education is likely to increase demand for health services as it raises the productivity of health production, the household's appreciation of the benefits of better health care, and its potential labor market earnings (Although theoretically education could reduce health service utilization by increasing the opportunity cost of time devoted to health care, most studies show that education have a positive effect, implying that its opportunity cost effect is less than the other putative effects of education.)

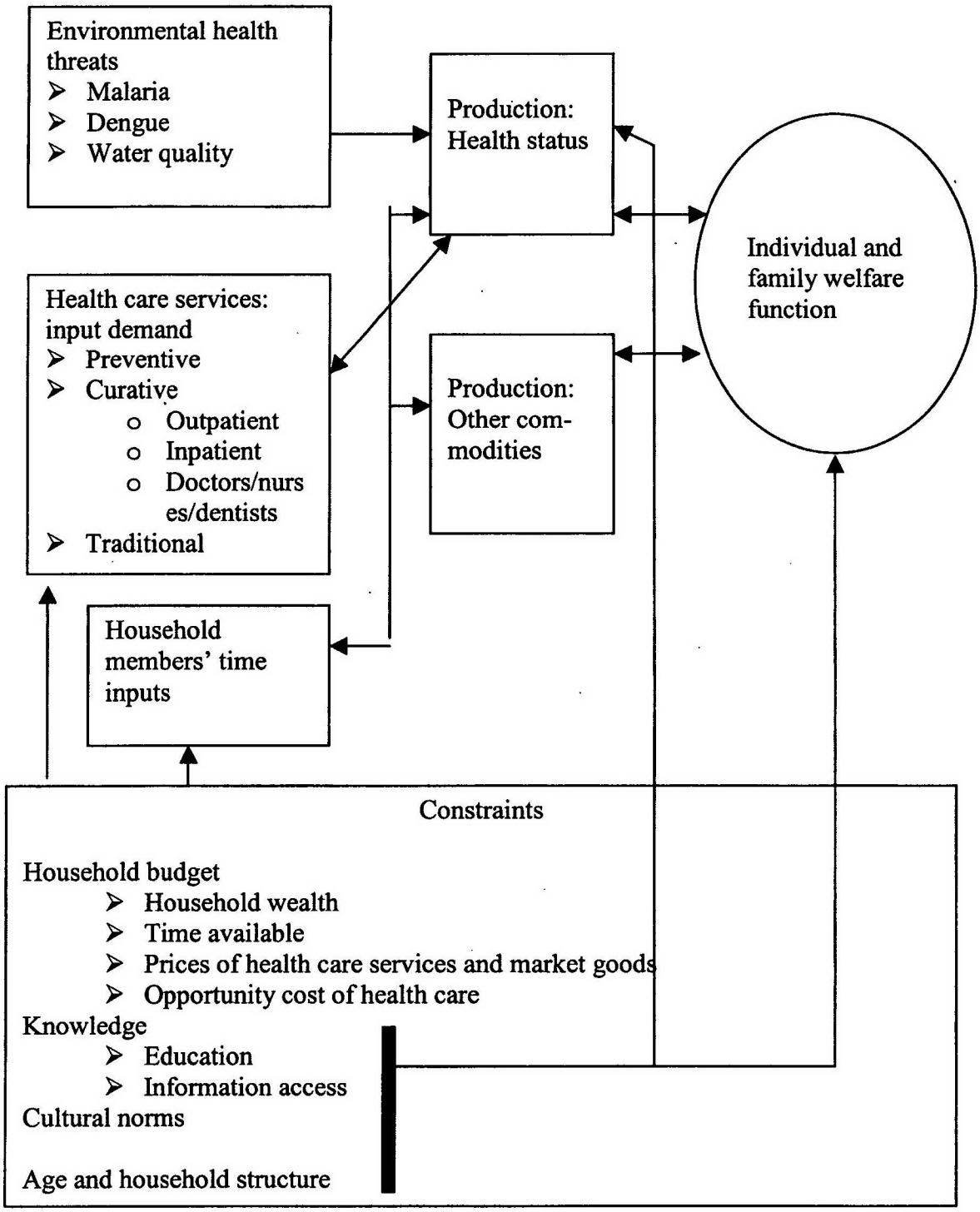
If an objective measure of health status were available and used as a dependent variable, it can be shown that the effects of the above-mentioned variables on health status would parallel their effects on health service utilization. For example, increased wealth, insurance coverage and reduced public health threats are expected to decrease morbidity. In this study, however, the illness data are based on the respondent's

assessment or perception of illness, which surely has a subjective element that needs to be taken into account in the interpretation of the empirical results.

Perceived illness is arguably determined by a person's experience of a physical or psychological condition that is limiting his ability to function normally. But what a person considers normal functioning and when he considers a restriction on that functioning an illness depends not only on the actual experience of a disease, but also on cultural norms regarding the definition of illness. It is difficult to have an objective definition of those norms. From casual observation, however, it can be argued that the norm for long-suffering people (e.g. the poor and marginalized indigenous population) is to be tough and, therefore, they might not report minor inconveniences as illness. On the other hand, these inconveniences are more likely to trigger a feeling of ill health for people with high income and insurance coverage. Hence, it is possible that wealth, health insurance and being non-indigenous would be correlated positively (instead of negatively) with reported illness.

Chart 1

An Economic Model of Health Production and Health Care Demand



Description of survey and variable definitions

The survey used in this paper is *Encuesta Nacional de Salud 2000*. The sample of this module consists of 190,214 observations (96,958,975 observations when weighted data are used). After cleaning the dataset 173,600 observations were left for analysis. To make sure that the sample was representative a comparison of some general characteristics from the survey with the 2000 Census was done. By employing INEGI's definition of indigenous people, which employs the use of an indigenous language as the main criteria, around 10 percent of the population on this survey can be considered indigenous. As mentioned, the 2000 Census classified some 8.4 million people as indigenous (8.6 percent), which implies that our sample is largely consistent. Also according to the 2000 Census, the age average is around 20-24 years, while in the sample it is around 25.4. Although there is a difference, it is not too big. The number of education years reported in our sample is a little bit below the national average. And, the percentage of men in our sample is similar to the Census estimates. Because the differences between our sample and the Census figures are small, it was decided to continue the analysis. Table 1 describes the variables employed.

Table 2 shows the descriptive statistics between indigenous and non-indigenous population. From this table it can be seen that the indigenous are poorer, younger and less healthy than the non-indigenous. They have a lower level of education and bad living conditions. Moreover, they have less health care service utilization, with the exception of preventive care services.

Table 3a shows the descriptive statistics between age groups, while Table 3b presents the utilization rate for preventive care, medical consultations and dental services, and hospitalization by urban and rural residence. It can be seen from Table 3a, on one hand, that children between 0-5 years old have the highest health care service utilization than any other age group, and in particular preventive health care utilization. From Table 3b, on the other hand, it can be gleaned that while the urban population has a higher hospitalization rate, the rural residents surprisingly have a higher preventive care utilization. Besides, there is no statistical difference between urban and rural rates in medical and dental consultations.

Regression Results.

Health service use. A number of health service utilization equations were estimated. Tables 4, 5 and 6 depict estimates for modern preventive care (PREVENUT), medical consultations and dental services (MODERMED), and inpatient hospital care (HOSPU), respectively. Each of these regressions were estimated for children aged 0-5 and 0-17, adult persons 18 years old and over, and women in childbearing age 15-49.

The results presented in these tables are consistent with the economic model of health care demand outlined above. In general, health insurance, wealth, education, and time-price variables are statistically significant and their regression coefficients have the expected signs.

In regard to the use of preventive care, health insurance appears to have a highly powerful impact. The odds of preventive care use are 13-17 percent for children with health insurance coverage than comparable kids without. These odds for adults with health insurance increase even more by about 37.5 percent. The coefficient of the distance variable also indicates that a half hour increase in the amount of time needed to reach providers of preventive care tend to decrease the odds of use of this service by about 6 percent. Individuals belonging to a large household tend to use less preventive services. An additional household member reduces the odds of preventive care use by about 5 percent for all demographic groups. As expected, the odds for an individual living in mosquito-infested area is about 16.1-23.6 percent higher relative to comparable persons.

Although the wealth index and education variable are positive and statistically significant for the above-mentioned demographic groups, its impact appears to be quite small. One possible explanation is that the educational and outreach programs of the government promoting low-cost but effective preventive care might have loosened up the income and price effects on the use of this health service.

The regression estimates show two surprising results. One is the finding (contrary to usual assertions) that the coefficients for the indigenous variable (Hhindig) are significant and positive for all demographic groups. The results indicate that, *ceteris paribus*, the odds of preventive care use rises by 15.5-19.2 percent and 28.4 and 30.3 percent for indigenous children and adults, respectively. The other surprise is the negative impact of living in urban areas. It appears that, holding other things constant, the odds of a person living in an urban area and using preventive health care services is less than that of a rural individual – 23.6 percent and 29.9 percent for children aged 0-5 and women aged 15-49. One possible explanation of these findings is that the intensification of government efforts over time (such as IMSS-Solidaridad, PAC and PROGRESA among others) to promote community-based primary health care in rural and marginalized areas might have now put rural and indigenous population groups in a relatively more advantageous position, holding health insurance and other differences constant. Anyway, whatever the reason for the above findings, its implication is that whatever cultural

disadvantages might had been associated with being rural and indigenous have been largely overcome insofar as modern preventive care is concerned.

In contrast, in the case of utilization of medical consultations and dental services (modermed), ethnicity has a significantly negative sign, as expected (Table 5). This variable incidentally is simply defined here as the utilization of doctors, nurses, or dentists. The negative impact of the ethnicity variable on the odds of medical and dental services utilization is considerable – about 14.0 percent for children 0-17 years old and 18.6 percent for adults (15.2 percent for women in the reproductive age). And it is interesting that in comparison to the preventive care regressions, the urban effect on medical and dental consultations is negative but not significant. As in the previous equations, however, mosquito infestation increases the use of these medical and dental services – it is particularly considerable for children.

The hospital utilization estimates (Table 6) provide an even more dramatic contrast to preventive care results. The ethnicity variable shows a large negative coefficient, indicating a marginal difference in inpatient hospital utilization of about 65.7 percent between the indigenous and non-indigenous population. This difference rises to 84.9 percent for children aged 0-5. These estimates also show that urban-rural difference in hospital utilization is substantial (14-20.7 percent) and statistically significant. It is also remarkable that the positive health insurance effect seems quite large at about 32.9-40.6 percent. The results further indicates that control of mosquito infestation can have a considerable negative impact on hospital utilization (about 36.8-39.7 percent), suggesting that such control could generate potential resource savings from reduced hospital care. In regard to Distance2 (a proxy for the time price of primary care), its positive coefficient shows that closer access of people to primary care services reduces hospitalization cases. A possible explanation is that those services prevent some illnesses from becoming more serious. Or it could be that primary care services are effectively acting as filters to higher-level health care.

The contrasting effects of the health insurance, urban and ethnicity variables can be interpreted as an indication that government efforts to improve access to secondary and tertiary care have not yet broken down existing economic, geographic and maybe cultural barriers to the same extent as the primary health care programs seem to have achieved. Accomplishing the de-linking of hospital utilization from urban residence and ethnicity is clearly much more difficult and expensive. It should be emphasized, though, that it has been appropriate for the government to focus on the extensive promotion of community-based primary health care to rural and marginalized areas.

The question at this point is: Does the negative regression coefficients of ethnicity in the Modermed and Hospu equations represent the effect of a cultural barrier associated with being indigenous? This is an interesting question, considering the apparent absence of a cultural barrier to the indigenous population's use of modern preventive care. Or does the negative coefficient reflect the effects of some unmeasured price and income

factors associated with the ethnicity variable?[7] This study is unable to untangle these possible effects.

Nevertheless, the findings strongly suggest that in any case there are economic instruments for reducing those cultural barriers, if they still exist. One such instrument is the provision of health insurance for the indigenous population. As shown in Table 7, health insurance appears to have a powerful impact on hospital use among the indigenous population. Providing insurance coverage to an indigenous person raises the odds of hospitalization by about 63.1 percent. Consistent with this finding, the wealth effect on hospital demand also appears to be quite considerable. In contrast to its tiny impact on preventive care utilization, an increase in the wealth variable by one unit is associated with a 92 percent increase in the odds of inpatient hospital care use.

Health status and reported illness. Moving beyond health service utilization, this section explores, using the same sample, the effects of ethnicity and other variables on people's assessment of their health status and on their reported illness condition. The regression results are presented in Table 7 and Table 8.

An examination of Table 8 reveals that holding other things constant, indigenous children and adults tend to assess themselves as healthy (in good or excellent health). The odds that they consider themselves healthy is about 10 percent higher relative to comparable non-indigenous persons. One possible explanation is that the indigenous population tends to use more preventive health care services. Alternatively, it might be that they are physically and mentally tougher than the non-indigenous people.

As expected, health insurance, education, urban-rural residence, and wealth appear to be significantly positive determinants of perceived health status. For example, the odds of being healthy are 9.7-15.2 percent higher for those with health insurance than those without it. Urban residents are associated with about 20 percent higher odds of being healthy. These findings imply reduced perceived health well being for the indigenous population, since most of them live in rural areas and they have lower levels of insurance coverage, education, and wealth. Further, it would appear that individuals feel less healthy in households with open water supply, which constitute about 50 percent of the indigenous population (as opposed to 35 percent for the non-indigenous). Finally, it is noteworthy that mosquito infestation reduces significantly perceived health status.

The study examines another measure of health well being, the reported illness (Morb = sick or not). The results are similar in some respects to that of the health status analysis, but different in others. As in the health status analysis, the regression estimates show that mosquito infestation and open water supply tend to raise reported illness; and

[7] For example, it might be that on average the indigenous people might have a higher cost of accessing hospital services and medical/dental consultations. Assuming that own price effect on hospital demand is negative and cross-price effect on preventive care, it is possible to explain the negative and positive coefficients of the ethnicity on hospital care and preventive services, respectively. A similar explanation can also be developed for the contrasting effects of the urban and rural variable on these services. The current analysis can not rule out these possibilities.

urban residence reduces it. Moreover, indigenous people tend to report less illness. In contrast, wealth, education, and insurance appear to be positively correlated with higher odds of illness. These findings confirm the suspicion expressed earlier in the discussion of the conceptual framework that poor people with less education and without insurance coverage tend to have a higher threshold for defining certain inconveniences, discomfort and pain as illness. The implication of these findings is that compared to their more educated and better off counterparts, the poor and indigenous people are more likely to delay examination and treatment of physical ailments before they get worse.

Conclusions

The findings of this study and their implications can be summarized as follows:

First, the indigenous people in Mexico, contrary to conventional wisdom, do tend to have a more positive behavior towards modern preventive care. Apparently, there is no cultural barrier in regard to these services; or at least, it can be argued that there are some mechanisms in place that have allowed the indigenous population to overcome cultural barriers (if any exist in the first place) to their use of modern preventive services.

Second, the effect of ethnicity on the use of inpatient hospital care and medical/dental consultations is negative and considerable. An explanation for this finding may be the high time price of using these services for the indigenous population; another may be some hitherto unidentified cultural barrier. The study could not untangle the reasons for this empirical result. Further research is needed to clarify the interpretation of the effect of ethnicity on the utilization of the above-mentioned services. But whatever the reason, the large disadvantage facing the indigenous population should be of great concern.

Third, it would appear that the people in rural areas are using more modern preventive services now than urban residents, due possibly to the effectiveness of Mexico's focus on promoting and expanding community-based primary health care coverage over the years. This finding suggests also the need now to pay greater attention to the promotion of preventive care among the poor and indigenous groups in urban areas. The government's decision to extend Oportunidades to the urban poor is consistent with this suggestion. Moreover, the analysis suggests the desirability of enriching with medical and secondary level services the package of basic health care being delivered to the marginalized rural and indigenous communities.

Fourth, price matters. The positive effect of insurance on health service utilization, which is quite large, is indicative of this proposition. The own price effect on the demand for preventive care is significant. Besides, a decrease in the time cost of accessing primary health services appears to reduce considerably the use of inpatient hospital care and, hence, curative care expenditures. Clearly, then, health insurance appears to be a highly effective instrument for addressing the health care disadvantages faced by the indigenous population in regard to inpatient care and the use of outpatient

services of doctors, nurses and dentists. A policy of expanding health insurance coverage to the indigenous people, as part of a policy of universalizing health insurance policy, could greatly improve their health care.

Fifth, improved water supply and greater control of public health threats like dengue and malaria reduce self-reported illness, raises health well being and saves curative resources. This finding illustrates the continued national importance of public health. It also underlines the importance of ensuring that the indigenous population has easier access to potable water supply and that the health system has sufficient resources for better control of public health threats. To illustrate the importance of this issue, a Bank analysis of the Chiapas health sector reveals a serious under-funding of public health activities to control vector-borne diseases, which are largely concentrated in indigenous communities.

The effectiveness of health care services depends on the extent to which they are tailored to the needs, constraints and priorities of individuals and local communities. These factors in turn are determined by historical and socio-cultural conditioning. For this reason, it makes sense to ensure that health programs are sensitive to the distinctive cultural differences among the various demographic groups. There are two approaches to achieve this sensitivity in the choice and design of health services. The first approach is the development of special interventions that are specifically directed to particular issues facing target ethnic groups without changing the structural features of the health system. These interventions are programs that are specially tailored to the diverse traditions and beliefs of target ethnic groups. Many of the current ideas to promote indigenous health to date are generally of this variety. The second approach is to promote reform of the health system structures to give communities and health providers the capability and incentive to tailor their programs to the economic and socio-cultural realities of the target population groups.

It is arguable that to achieve sustained reduction in the health gap between the indigenous and the mainstream population, Mexico needs to follow both approaches. The purpose of the systemic approach is to change the rules governing the public finance and delivery of health services at the federal, state and local levels so that health providers will be enabled and rewarded for reaching out to their intended beneficiaries and tailoring their health services to the needs and cultural background of said consumers.

This approach calls for the support of the following reform ideas: (i) the deepening of the process of decentralization, pushing down more decision rights to local communities, health care providers and consumers; (ii) the transformation of supply to demand-based subsidy (money follows the intended beneficiaries); (iii) use of public and private competition for the delivery of a defined package of basic health services; (iv) expansion of subsidized health insurance coverage of the indigenous and other disadvantaged groups, initially employing public funds currently being used to finance public delivery of services for the open population; and (v) measures that promotes equalization of health subsidy per open population, not to mention increased subsidy for

the marginalized, indigenous communities to compensate for their economic disadvantages.

In principle, these concepts would make the health system more sensitive to the culture and tradition of the various ethnic groups. But how to apply them in reality needs further reflection and pilot testing. Consequently, in thinking about health system reforms, it would be useful to support pilot programs that try out the above ideas in indigenous communities. Finally, considering that the above reforms would benefit the general population without health insurance, advocates of indigenous population development can and should build a strong coalition between the various ethnic groups and those in the open population interested in making publicly financed health services more responsive to local and individual demands.

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Table 1. **Description of Variables**

Dependent variables	*Variable*	*Description*
Total utilization	totalu	1 if individual has utilized a health care service in the last 30 days
Utilization of medical or dental services	modermed	1 if the person was sick during the last year sought care from medical doctor, nurse, or dentist
Hospitalisation	hospu	1 if the individual has been hospitalised in the last year
Preventive health care services utilization	prevenut	1 if individual has utilized preventive health care in the last year
Morbidity	morb	1 if the individual had a disease, accident, or any health problem in the last 2 weeks
Healthy	healthy	1 if the individual has an excellent or good health status
Independent variables		
Individual characteristics		
Age	age	Age of the individual
Age2	age2	Age of the individual squared
Own years of education	edyears	Number of years of education of individual
Spouse	hs	1 if the individual is a spouse
Indigenous	indigenous	1 if the household head speaks an indigenous language
Male	male	1 if the individual is a male
Married	married	1 if the individual is married
Widow	widow	1 if the individual is a widow
Divorce	divorce	1 if the individual is divorced
Separated	separated	1 if the individual is separate from his/her spouse
Free union	freeun	1 if the individual is under free union
Single	single	1 if the individual is single (Omitted variable)
Excellent health status	excelhs	1 if the individual has an excellent health status
Good health status	goodhs	1 if the individual has a good health status
Regular health status	regularhs	1 if the individual has a regular health status (Omitted variable)
Bad health status	badhs	1 if the individual has a bad health status
Very bad health status	vbadhs	1 if the individual has a very bad health status
Household characteristics		
Wealth	wealth1	Composite measure that depends upon the household characteristics such as: ceiling, floor, walls, and kitchen. The variable's range is from 0 to 4, being 0 the lowest.
Insurance	insurance2	1 if the household head has a medical insurance
Distance	distance2	Commuting time to the closest ambulatory care center
Household size	hsize	Number of individuals in the house
Water storage	opwat	1 if the household stores water in open containers
Urban	urban	1 if the household is located in an urban area
Mosquito diseases in the community	mosq	1 if the individual knows of any case of malaria or dengue in the community
Household member had dengue or malaria	paludrel	1 if any member of the household had malaria or dengue
Household head characteristics		
Age	hhage	Age of household head
Years of education	hhedu	Number of years of education
Household spouse characteristics		
Age	hsagemar	Age of household head
Years of education	hsedumar	Number of years of education

Table 2. Summary Statistics

Variable	Non-Indigenous		Indigenous		
	Mean	Standard Deviation	Mean	Standard Deviation	T-test/Chi-square
totalu	0.47		0.45		24.6*
hospu	0.068		0.035		275.0*
prevenut	0.28		0.31		67.9*
modermed	0.087		0.06		144.4*
morb	0.1		0.1		0.0
healthy	0.6		0.58		25.5*
age	25.8	19.2	21.8	18.2	27.0*
edyears	5.8	4.6	4.1	3.7	55.4*
hhage2	44.4	14.5	44.3	14.3	0.9
hhedu	6.6	4.6	4.2	3.7	78.2*
hs	0.17		0.1		548.9*
hsagemar	26.2	22.1	26.9	21.6	-4.0*
hsedumar	4.25	4.6	2.5	3.3	62.8*
wealth1	3.2	1	2.3	1.2	94.2*
insurance2	0.5		0.2		5,525.5*
hsize	5	2.1	6	2.4	-52.1*
distance2	39.8	151.4	38.7	108.2	1.2*
Male	0.5		0.5		0.0
hmarried2	0.7		0.7		0.0
mosq	0.1		0.1		0.0
paludrel	0.07		0.07		0.0
opwat	0.35		0.5		1,485.5*
urban	0.5		0.14		7,968.7*
excelhs	0.04		0.01		385.6*
goodhs	0.6		0.6		0.0
regularhs	0.34		0.36		27.2*
badhs	0.05		0.04		32.8*
vbadhs	0.003		0.002		5.3*

Table 3a. Summary Statistics II

Variable	All	Children age 0-17	Adults age 18 and over	Children age 0-5	Women age 15-49
	Mean (Standard Deviation)	Mean (Standard Deviation)	Mean (Standard Deviation)	Mean (Standard Deviation)	Mean (Standard Deviation)
totalu	0.47	0.48	0.46	0.75	0.5
hospu	0.06	0.05	0.08	0.05	0.07
prevenut	0.28	0.34	0.24	0.65	0.3
modermed	0.08	0.09	0.08	0.15	0.08
morb	0.14	0.14	0.14	0.22	0.1
healthy	0.6	0.67	0.54	0.66	0.57
age	25.4	8.4	38	2.4	29.1
	(19.1)	(5.1)	(15.7)	(1.7)	
edyears	5.6	3	7.6		8.1
	(4.5)	(3.3)	(4.3)		(3.8)
hhage2	44.3	40.9	46.9	36.8	43.4
	(14.5)	(12.4)	(15.4)	(13.1)	(13.6)
hhedu	6.4	6.2	6.5	6.7	6.7
	(4.6)	(4.5)	(4.6)	(4.4)	(4.6)
hs	0.17	0.004	0.3		0.46
hsagemar	26.3	23.7	28.2	20.4	25.1
	(22)	(19.8)	(23.3)	(18.4)	(21.4)
hsedumar	4.1	3.9	4.2	4.2	4.2
	(4.5)	(4.4)	(4.6)	(4.7)	(4.6)
wealth1	3.1	2.97	3.2	2.9	3.1
	(1.1)	(1.1)	(1)	(1.1)	(1)
insurance2	0.47	0.4	0.5	0.4	0.47
hhindig	0.1	0.1	0.08	0.12	0.08
hsize	5.1	5.6	4.7	5.3	5
	(2.1)	(2.1)	(2.1)	(2.1)	
distance2	39.7	38	41	34.2	39.5
	(147.7)	(143.3)	(150.9)	(133.5)	
Male	0.47	0.5	0.46	0.5	
married					0.46
widow					0.01
divorce					0.01
separated					0.03
freeun					0.1
hmarried2	0.7	0.7	0.7	0.7	
mosq	0.1	0.1	0.1	0.1	0.1
paludrel	0.07	0.07	0.07	0.06	0.07
opwat	0.36	0.4	0.3	0.4	0.35
urban	0.5	0.4	0.5	0.4	0.5
excelhs	0.04	0.04	0.04	0.04	0.04
goodhs	0.56	0.6	0.5	0.6	0.5
regularhs	0.34	0.29	0.37	0.3	0.37
badhs	0.04	0.02	0.06	0.02	0.04
vbadhs	0.003	0.0008	0.005	0.001	0.003

Table 3b. Utilization rates of health services by type and urban-rural

Variable	Urban		Rural		
	Mean	Standard Deviation	Mean	Standard Deviation	T-test/Chi-square
hospu	0.077	0.27	0.053	0.22	21.1*
prevenut	0.275	0.447	0.288	0.453	-6.2*
modermed	0.077	0.27	0.053	0.224	21.1

Table 4. Logit regression estimates: use of modern preventive health services (prevenut)

Variables	Children age 0-17		Adults age 18 and over		Children age 0-5		Women age 15-49	
	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error
Age	-0.51*	0.007	0.022*	0.0027	-0.41*	0.03	-0.021*	0.009
Age2	0.018*	0.0004	-0.00005	0.00003	0.00001	0.006	0.0002	0.0001
Edyears			0.011*	0.002			0.018*	0.003
Hhage2	-0.0002	0.0009	-0.001*	0.0007	-0.0007	0.001	-0.006*	0.001
Hhedu	0.018*	0.003			0.016*	0.004		
Hs	1.43*	0.114	0.585*	0.02			0.177*	0.03
Hsagemar	-0.0007	0.0009	-0.005*	0.0007	0.001	0.001	-0.002*	0.0007
Hsedumar	0.018*	0.003			0.012*	0.005		
Wealth1	0.006	0.009	0.013	0.008	-0.005	0.01	-0.019	0.01
Insurance2	0.172*	0.02	0.375*	0.01	0.139*	0.03	0.188*	0.02
Hhindig	0.155*	0.029	0.284*	0.03	0.192*	0.05	0.303*	0.04
Hsize	-0.052*	0.005	-0.082*	0.004	-0.049*	0.007	-0.06*	0.006
Distance2	-0.002*	0.0003	-0.002*	0.0002	-0.002*	0.0004	-0.001*	0.0002
Married							1.36*	0.041
Widow							0.935*	0.105
Divorce							0.915*	0.109
Separated							0.734*	0.07
Male	-0.093*	0.018	-1.12*	0.021	0.033	0.03		
Hmarried2	-0.014	0.035	0.228*	0.03	-0.091	0.05		
Freeun							1.24*	0.05
Mosq	0.206*	0.03	0.161*	0.02	0.236*	0.05	0.216*	0.04
Paludrel	-0.057	0.037	0.042	0.03	0.041	0.06	-0.021	0.02
Opwat	-0.002	0.019	0.028	0.02	-0.006	0.03	0.052*	0.02
Urban	-0.194*	0.02	-0.191*	0.02	-0.06	0.03	-0.299*	0.02
Excelhs	0.02	0.049	-0.25*	0.04	-0.004	0.08	-0.248	0.06
Goodhs	-0.031	0.02	-0.218*	0.02	-0.0002	0.03	-0.1003	0.02
Badhs	0.005	0.063	0.277*	0.03	0.03	0.01	0.304*	0.05
Vbadhs	0.037	0.3	0.157	0.1	-0.113	0.364	0.233	0.184
_cons	1.98*	0.060	-0.904*	0.07	1.84*	0.09	-0.576	0.14
Number of obs	74,060		92,480		24,360		41,801	
Wald chi2	14,374		10,060.6		2,300.2		3,907.3	
Log likelihood	-38,067.6		-45,253.5		-14,382.137		23,862.52	

*Statistically significant at the 95 percent level of confidence
Robust Standard Errors

Table 5. Logit regression estimates: medical consultations and dental services (modermed)

Variables	Children age 0-17		Adults age 18 and over		Children age 0-5		Women age 15-49	
	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error
Age	-0.187*	0.009	0.027*	0.004	-0.169*	0.04	-0.013	0.01
Age2	0.005*	0.0005	-0.0001*	0.00004	0.001	0.008	0.0004*	0.0002
Edyears			0.023*	0.003			0.028*	0.005
Hhage2	0.004*	0.001	-0.005*	0.001	0.005*	0.002	-0.003	0.002
Hhedu	0.032*	0.004			0.036*	0.005		
Hs	0.422*	0.2	0.182*	0.03			0.276*	0.06
Hsagemar	-0.004*	0.001	-0.004*	0.001	-0.001	0.002	-0.004*	0.001
Hsedumar	0.023*	0.004			0.018*	0.006		
Wealth1	0.109*	0.01	0.088*	0.01	0.068*	0.02	0.074	0.02
Insurance2	0.262*	0.03	0.299*	0.02	0.231*	0.04	0.253*	0.04
Hhindig	-0.14	0.05	-0.186*	0.05	-0.118	0.07	-0152*	0.07
Hsize	-0.095*	0.008	-0.058*	0.006	-0.085*	0.01	-0.054*	0.011
Distance2	-0.001*	0.0004	-0.001*	0.0001	-0.001	0.0004	-0.001	0.0004
Male	-0.036	0.03	-0.368*	0.03	0.009	0.04		
Hmarried2	0.117*	0.05	0.251*	0.04	0.125	0.07		
Married							0.238*	0.07
Widow							0.157	0.148
Divorce							0.135	0.162
Separated							0.229*	0.107
Freeun							-0.021	0.085
Mosq	0.149*	0.04	0.061	0.04	0.276*	0.06	0.088	0.05
Paludrel	0.051	0.05	0.188*	0.04	0.014	0.08	0.153*	0.066
Opwat	-0.086*	0.03	0.003	0.02	-0.064	0.04	0.001	0.04
Urban	-0.035	0.03	-0.014	0.02	-0.009	0.042	0.007	0.04
Excelhs	-1.28*	0.09	-1.334*	0.09	-1.24*	0.118	-1.38*	0.131
Goodhs	-0.847*	0.03	-0.872*	0.03	-0.814*	0.04	-0.931*	0.04
Badhs	0.811*	0.07	0.995*	0.03	0.757*	0.09	1.02*	0.056
Vbadhs	1.026*	0.313	1.36*	0.1	0.643	0.39	1.48*	0.170
_cons	-1.23*	0.09	-3.11*	0.111	-1.32*	0.116	-2.53*	0.229
Number of obs	74,077		99,523		24,360		47,572	
Wald chi2	3,791.80		4,871.2		1,115.9		1,981.2	
Log likelihood	19,835.9		-25,791.9		9,509.9		12,268.8	

*Statistically significant at the 95 percent level of confidence
Robust Standard Errors

Table 6. Logit regression estimates: hospitalization (hospu)

Variables	Children age 0-17		Adults age 18 and over		Children age 0-5		Women age 15-49	
	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error
Age	-0.121*	0.01	-0.02*	0.003	-0.440*	0.05	-0.038*	0.15
Age2	0.007*	0.0007	0.003*	0.00004	0.062*	0.01	0.004	0.0002
Edyears			0.003	0.003			0.026*	0.005
Hhage2	0.004*	0.001	-0.007*	0.001	0.004	0.002	-0.002	0.001
Hhedu	0.004	0.005			0.009	0.008		
Hs	0.573*	0.2	-0.08*	0.03			-0.225*	0.06
Hsagemar	-0.004*	0.002	-0.004*	0.001	-0.005	0.003	-0.004*	0.001
Hsedumar	0.016*	0.006			0.014	0.009		
Wealth1	0.0008	0.02	0.01	0.012	0.002	0.02	0.017	0.02
Insurance2	0.406*	0.04	0.4*	0.03	0.457*	0.06	0.329*	0.04
Hhindig	-0.657*	0.08	-0.356*	0.06	-0.849*	0.13	-0.432*	0.08
Hsize	0.078*	0.009	0.074	0.006	0.079*	0.01	0.012	0.01
Distance2	0.0002*	0.00006	0.00001	0.00006	0.0001	0.0001	8.41e-6	0.00008
Male	0.076*	0.03	0.17*	0.03	0.143	0.058		
Hmarried2	-0.168*	0.07	0.099*	0.05	-0.892*	0.119		
Married							0.473*	0.65
Widow							0.538*	0.153
Divorce							0.027	0.182
Separated							0.258*	0.111
Freeun							0.491*	0.0791
Mosq	0.082	0.06	-0.015	0.04	0.037	0.103	0.022	0.06
Paludrel	0.368*	0.06	0.09*	0.04	0.397*	0.114	0.140*	0.07
Opwat	-0.023	0.04	-0.011	0.03	0.010	0.06	-0.019	0.04
Urban	0.207*	0.04	0.15*	0.03	0.151*	0.07	0.140*	0.41
Excelhs	-0.169	0.09	-0.085	0.06	-0.333*	0.158	-0.202*	0.09
Goodhs	-.123	0.04	-0.13*	0.03	-0.228*	0.06	-0.226*	0.04
Badhs	0.616*	.095	0.6*	0.04	0.772*	0.144	0.478*	0.08
Vbadhs	0.745	0.43	1.1*	0.1	0.564	0.61	0.834*	0.22
_cons	-3.40	0.113	-3.40	0.113	-3.21*	0.177	-2.37*	0.229
Number of obs	74,077		99,523		24,360		47,572	
Wald chi2	715.7		934		348.5		401.6	
Log likelihood	13,920.2		-26,807.1		4,766.3		11,651.4	

*Statistically significant at the 95 percent level of confidence
Robust Standard Errors

Table 7. Logit regression estimates: indigenous population (all ages)

Variables	Hospitalization	
	Regression coefficient	Standard error
Age	0.003	0.01
Age2	0.00005	0.0001
Edyears	0.024	0.01
Hhage2	0.004	0.003
Hhedu2	-0.0003	0.01
Hs	-0.310*	0.145
Hsagemar	-0.215*	0.003
Hsedumar2	-0.062*	0.02
Age18plus	0.267	0.238
Wealth1	0.915*	0.03
Insurance2	0.631*	0.101
Hsize	0.0005	0.01
Distance2	0.001*	0.0001
Male	0.082	0.09
Hmarried2	0.941*	0.156
Mosq	0.161	0.127
Paludrel	0.487	0.149
Opwat	0.228*	0.08
Urban	0.431*	0.114
Excelhs	-0.652	0.407
Goodhs	-0.231*	0.09
Badhs	0.522*	0.171
Vbadhs	0.128	0.762
_cons	-4.54*	0.284
Number of obs	16,951	
Wald chi2	433.8	
Log likelihood	2,432.0791	

*Statistically significant at the 95 percent level of confidence
Robust Standard Errors

Table 8. Logit regression estimates: determinants of health status of total population

Variables	Children 0-17 years old				Adults 18 years old and over			
	Self-reported illness (morb)		Self-reported health: good-excellent (healthy)		Self-reported illness (morb)		Self-reported health: good-excellent (healthy)	
	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error	Regression coefficient	Standard error
Age	-0.156*	0.007	0.010	0.005	0.033*	0.002	-0.043*	0.002
Age2	0.004*	0.0004	-0.0003	0.0003	-0.0001*	0.00003	0.0001*	0.0002
Edyears					-0.008*	0.002	0.025*	0.002
Hhage2	-0.0008	0.001	0.005*	0.0008	-0.005*	0.0008	0.006*	0.0007
Hhedu	0.014*	0.003	0.019*	0.002			0.025*	0.002
Hs	0.272	0.159	-0.00075	0.121	0.0925*	0.02	-0.045*	0.019
Hsagemar	-0.003*	0.001	0.0008	0.0007	-0.002*	0.008	-0.0008	0.0005
Hsedumar	0.012*	0.003	0.019*	0.002			0.021*	0.002
Wealth1	0.083*	0.01	0.0008	0.008	0.057*	0.009	0.013*	0.006
Insurance2	0.042	0.02	0.152*	0.18	0.050*	0.02	0.093*	0.01
Hhindig	-0.257*	0.03	0.101*	0.02	-00.33*	0.04	0.097*	0.02
Hsize	-.0833*	0.006	0.004	0.0004	-0.069*	0.005	-0.004	0.003
Distance2	-0.0007*	0.0001	0.0002*	0.00006	-0.0008*	0.0001	0.0002*	0.00004
Male	-0.05*		0.006	0.01	0.382*	0.02	0.278*	0.016
Hmarried2	0.037	0.04	-0.119*	0.03	0.105*	0.03	-0.069*	0.02
Mosq	0.123*	0.035	-0.042*	0.02	0.083*	0.031	-0.087*	0.02
Paludrel	0.114*	0.04	-0.209*	0.03	0.214*	0.03	-0.190*	0.02
Opwat	0.040	0.022	-0.17*	0.01	0.095*	0.02	-0.180*	0.01
Urban	-0.015	0.02	0.207*	0.01	-0.056*	0.02	0.216*	0.01
cons	-0.81*	0.06	0.2008	0.05	-2.280*	0.084	0.648*	0.06
Number of obs	74,077		74,077		99,523		99,523	
Wald chi2	2,698.		1,176.6		2,413.2		6,791.5	
Log likelihood	29,209.9		46,157.5		39,082.		64,781.6	

*Statistically significant at the 95 percent level of confidence
Robust Standard Errors

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